N 536 - Utilization of Nursing Research in Advanced Practice, Summer 2008

Tzeng, Huey-Ming

http://hdl.handle.net/2027.42/64943
Unless otherwise noted, the content of this course material is licensed under a Creative Commons 3.0 License. 
http://creativecommons.org/licenses/by/3.0/

Copyright 2008, Huey-Ming Tzeng, Sonia A. Duffy, Lisa Kane Low.

The following information is intended to inform and educate and is not a tool for self-diagnosis or a replacement for medical evaluation, advice, diagnosis or treatment by a healthcare professional. You should speak to your physician or make an appointment to be seen if you have questions or concerns about this information or your medical condition. You assume all responsibility for use and potential liability associated with any use of the material.

Material contains copyrighted content, used in accordance with U.S. law. Copyright holders of content included in this material should contact open.michigan@umich.edu with any questions, corrections, or clarifications regarding the use of content. The Regents of the University of Michigan do not license the use of third party content posted to this site unless such a license is specifically granted in connection with particular content objects. Users of content are responsible for their compliance with applicable law. Mention of specific products in this recording solely represents the opinion of the speaker and does not represent an endorsement by the University of Michigan.
Research Design

Contributors
Sonia A. Duffy, PhD, RN
Lisa Kane Low, PhD, CNM, FACNM
Huey-Ming Tzeng, PhD, RN
Design Characteristics

- Maximizes control over factors to increase the validity of the findings
- Guides the researcher in planning and implementing a study
Level of Control: Quantitative Research

- Descriptive
- Correlational
- Quasi-experimental
- Experimental

Increased Control with Design
Concepts Relevant to Research Design (1)

**Causality**

A \[ \rightarrow \] B
Pressure \[ \rightarrow \] Ulcer

**Multicausality**

Years smoking
High fat diet \[ \rightarrow \] Heart disease
Limited exercise
Concepts Relevant to Research Design (2)

- Probability: Likelihood of an outcome
- Bias: Slanting findings
- Manipulation: Treatment
- Control: All phases of design
Design Validity

• Measure of accuracy of a study

• Examined with critique of the following dimensions:
  o Statistical conclusion validity
  o Internal validity
  o Construct validity
  o External validity
Elements of a Strong Research Design (1)

- Controlling the environment of the study setting

- Levels of controlling:
  - Natural setting
  - Partially controlled setting: e.g., clinics
  - Highly controlled setting: e.g., laboratory
Elements of a Strong Research Design (2)

- Controlling the equivalence of subjects and groups
  - Random subject selection
  - Random assignment to groups
Elements of a Strong Research Design (3)

- **Controlling the treatment**
  - Choose a treatment based on research and practice
  - Develop a protocol for implementation
  - Document the implemented treatment
  - Use a check-list to determine the extent of completeness to which the treatment was implemented
  - Evaluate the treatment during the study
Elements of a Strong Research Design (4)

• Controlling measurement
  - Reliability
  - Validity
  - Number of measurement methods
  - Types of instruments
Elements of a Strong Research Design (5)

- **Controlling extraneous variables**
  - Identify and eliminate extraneous variables via sample criteria, choice of settings, or research design
  - Random sampling
  - Sample: Heterogenous, homogeneous, or matching
  - Statistical control
Problems with Study Designs

- Inappropriate for the study purpose or the research framework
- Poorly developed designs
- The research methods were poorly implemented
- Inadequate treatment, sample, or measurement methods
Selecting a Design

Is there a treatment?

- No
  - Is the primary purpose examination of relationships?
    - No
      - Descriptive Design
    - Yes
      - Will the sample be studied as a single group?
        - No
          - Correlational Design
        - Yes
          - Quasi-Experimental Study

- Yes
  - Is the treatment tightly controlled by the researcher?
    - No
      - Will a randomly assigned control group be used?
        - No
          - Is the original sample randomly selected?
            - No
              - 
            - Yes
              - Experimental Study
    - Yes
      - 

Research Design
Selecting a Descriptive Design

Examining sequences across time?

- Yes
  - Following same subjects across time?
    - Yes
      - Single unit of study
    - No
      - Studying events partitioned across time?
        - Yes
          - Case Study
        - No
          - Trend Analysis

- No
  - Cross-sectional design

One Group?

- No
  - Comparative Descriptive Design

- Yes
  - Descriptive Design

Data collected across time

- No
  - Cross-sectional design

- Yes
  - Longitudinal Study

Repeated measures of each subject

- Yes
  - Longitudinal design with treatment partitioning

- No
  - Trend Analysis

Cross-sectional design with treatment partitioning

Research Design
A Typical Descriptive Design

Clarification ➔ Measurement ➔ Description ➔ Interpretation

Phenomenon of Interest

Variable 1 ➔ Description of Variable 1
Variable 2 ➔ Description of Variable 2
Variable 3 ➔ Description of Variable 3
Variable 4 ➔ Description of Variable 4

Interpretation of Meaning ➔ Development of Hypotheses
A Comparative Descriptive Design

Group I
{variables measured}

Describe

Comparison of Groups on Selected Variables

Interpretation of Meaning

Development of Hypotheses

Group II
{variables measured}

Describe

Describe
Selecting the Type of Correlational Design

Describe relationships between/among variables?  
- Descriptive correlational design

Predict relationships between/among variables?  
- Predictive correlational design

Test theoretically proposed Relationships?  
- Model testing design
A Descriptive Correlational Design

**Measurement**

Research Variable 1 → Description of variable → Examination of Relationship → Interpretation of Meaning

Research Variable 2 → Description of variable → Development of Hypotheses
A Predictive Design

Value of Intercept + Value of Independent Variable 1 + Value of Independent Variable 2 = Predicted Value of Dependent Variable
Selecting The Type of Quasi-Experimental Design

1. Control Group?
   - No
     - Pretest?
       - No
         - One-group post-test only design
       - Yes
         - Repeated Measures?
           - No
             - Strategy for Comparison
               - No
                 - Suggest Reevaluating design
                 - One group pretest/post-test design
               - Yes
                 - Compare treatment & control conditions?
           - Yes
             - Yes
               - Pretest?
Selecting The Type of Experimental Design

- Pretest
  - No
    - Post-test only control group design
  - Yes
    - Repeated Measurements?
      - No
        - Examine effects of confounding variables?
          - No
            - Multiple sites?
              - Pretest/post-test control group design
          - Yes
            - Blocking?
              - No
                - Comparison of multiple levels of treatment
                - Pretest/post-test control group design
              - Yes
                - Randomized Block Design
                  - Examination of complex relationships among variables in relation to treatment
                  - Nested Designs

### Pretest-Post Test, Control Group Designs

<table>
<thead>
<tr>
<th>Randomly selected experimental group</th>
<th>Measurement of dependent variables</th>
<th>Manipulation of independent variables</th>
<th>Measurement of dependent variables</th>
</tr>
</thead>
<tbody>
<tr>
<td>randomly selected control group</td>
<td>PRETEST</td>
<td>TREATMENT</td>
<td>POST-TEST</td>
</tr>
</tbody>
</table>

**Treatment:** Under control of researcher

**Findings:**
- Comparison of pretest and post-test scores
- Comparison of experimental and control groups
- Comparison of pretest-post-test differences between samples

**Example:** Your self (1990). The impact of group reminiscence counseling on a depressed elderly population.

**Uncontrolled threats to validity:**
- Testing
- Mortality

**Instrumentation:** Restricted generalizability as control increases
## Post-Test-Only Control Group Design

<table>
<thead>
<tr>
<th>Measurement of independent variables</th>
<th>Measurement of dependent variables</th>
</tr>
</thead>
<tbody>
<tr>
<td>Randomly selected experimental group</td>
<td>TREATMENT</td>
</tr>
<tr>
<td>Randomly selected control group</td>
<td></td>
</tr>
</tbody>
</table>

**Treatment:** Under control of researcher

**Findings:** Comparison of experimental and control groups


**Uncontrolled threats to validity:**
- Instrumentation
- Mortality
- Limited generalizability as control increases
# Nested Design

## Pain Control Management

<table>
<thead>
<tr>
<th>Traditional care</th>
<th>PRN Medication</th>
<th>New approach: “Around the clock” medication</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Unit A</td>
<td>Unit E</td>
</tr>
<tr>
<td></td>
<td>Unit B</td>
<td>Unit F</td>
</tr>
<tr>
<td></td>
<td>Unit C</td>
<td>Unit G</td>
</tr>
<tr>
<td></td>
<td>Unit D</td>
<td>Unit H</td>
</tr>
</tbody>
</table>

## Primary Nursing Care

<table>
<thead>
<tr>
<th>Primary Care</th>
<th>No Primary Care</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unit A</td>
<td>Unit B</td>
</tr>
<tr>
<td>Unit C</td>
<td>Unit D</td>
</tr>
<tr>
<td>Unit E</td>
<td>Unit F</td>
</tr>
<tr>
<td>Unit G</td>
<td>Unit H</td>
</tr>
</tbody>
</table>

Research Design
Advantages of Experimental Designs

- More controls in design and conducting a study
- Increased internally validity
  - Decreased threats to design validity
- Fewer rival hypotheses
Advantages of Quasi-Experimental Designs

- More practical
  - Ease of implementation
- More feasible
  - Resources, subjects, time, setting
- More generalizable
  - Comparable to practice
Developing the Design Section of Your Proposal

- Identify the design
  - Name it specifically

- Provide a map of the design
- Discuss your rationale for using this design
- Describe threats to the validity of the chosen design